

REMARKS

Applicants thank the Examiner for the thorough consideration given the present application. Claims 1-6, 9 and 10 are currently being prosecuted. Claim 1 has been amended to substantially include the features of original claims 3 and 4. In addition, claim 7 has been cancelled and the subject matter has been added to claim 6. Claims 9 and 10 have been amended to dependent on revised claim 6. The Examiner is respectfully requested to reconsider his rejections in view of the Amendments and Remarks as set forth hereinbelow.

Claims 3-5 stand rejected under 35 U.S.C. 102(b) as being anticipated by Jolly et al., U.S. Patent No. 5,845,236. This rejection is respectfully traversed.

As indicated above, claims 3 and 4 have been amended to depend from and include the features of amended claim 1. Claim 5 depends alternatively from claims 3 and 4.

It is respectfully pointed out that the Examiner did not reject claim 1 in view of the Jolly et al. patent. Since claims 3 and 4 now depend from claim 1, the Examiner's rejection of claims 3-5 based on the Jolly et al. patent has been obviated.

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakao et al., U.S. Patent No. 5,651,072. This rejection is respectfully traversed.

As the Examiner will note, claim 1 has been amended to include a significant portion of the subject matter of claims 3 and 4. It is respectfully submitted that the claims 1-8 define patentably over Nakao et al. for the following reasons.

Amended claim 1 is directed to a combination of elements wherein not only is a noise cancellation-confirming microphone used but also a microphone for producing a reference signal is used and is disposed in the passenger compartment. Accordingly, not only noises from sources such as the engine, but also noises occurring in the passenger compartment, in particular road noises and the like, can be reduced.

Further, the claimed invention is directed to an active noise control circuit within a closed space such as the passenger compartment, thereby providing an active noise control circuit for canceling noises in the passenger compartment based on low frequency road noise in a predetermined wavelength range.

In contradistinction thereto, all of the cited references, including Nakao et al. and newly cited Jolly et al., make use solely of a reference signal that is synchronized with a noise source from the engine or the like. Thus, the references are directed only to reducing certain types of noises (i.e., a booming noise) produced from sources such as engine noises and the like. More specifically, the Nakao et al. patent is directed to a vibration reducing apparatus for canceling out engine noise (booming), wherein microphones 7-1 to 7-L are disposed inside the vehicle compartment to serve as a vibration sensor. The microphones would correspond to the "noise cancellation confirming microphones" of the present invention. When, as in the Nakao et al. patent, a large number of cancellation confirming microphones are used, for example when selecting which microphone is to be used, the LMS calculation load becomes excessively large. Further, a control means for selecting a

microphone to be used is essential in the Nakao et al. patent. The effect of such a control means, as shown in Figures 8 and 9 of the Nakao et al. patent, is for canceling resonance inside of the vehicle compartment based on a reference signal from the engine, and thus such a control is clearly different from that used in the claimed invention.

Further, as set forth in claim 4, by disposing the microphone for producing the reference signal centrally inside the passenger compartment, it is difficult for the microphone to be affected by extraneous external noises such as the opening and closing of the windows. Further, with respect to such external noises, unlike the system of Nakao et al., it is not necessary to recalculate sensitivity and select a microphone. By positioning the microphone centrally, the effects of extraneous noises such as wind and the like can be diminished.

Accordingly, since the cited prior art does not disclose the use of both a noise cancellation-confirming microphone, as well as a microphone for producing a reference signal, wherein the respective microphones serve different functions for reducing different types of noises, i.e., not only engine noises but also road noises occurring in the passenger compartment, the combination of elements as set forth in amended claim 1 are not obvious in view of the Nakao et al patent.

It is respectfully submitted that claim 2 should be allowable as a dependent claim, substantially for the same reasons as claim 1.

With respect to dependent claim 3, the noise cancellation-confirming microphone includes a combination of elements wherein a plurality of noise cancellation-confirming

microphones are positioned respectively near laterally spaced roof rails of the vehicle in confronting relationship to the ears of the occupants seated in the passenger compartment. By arranging the noise cancellation-confirming microphones at positions on the left and right roof rails in this manner, the relative positioning of the speaker (25) and the microphones (43, 44) permit a transfer function therebetween that does not vary even if the positioning of the front seats is changed.

The transfer characteristic with respect to passenger compartment noise, from the speaker (25) to reaching a position near the roof rails (30A, 30B) in confronting relation to the ears of the occupants in the front seats, is effective within a predetermined frequency range. With respect to claim 6, a similar feature is also true with respect to the level of sound pressure. Stated otherwise, when the noise cancellation-confirming microphones are installed respectively near the laterally spaced roof rails of the vehicle in confronting relation to the ears of occupants seated in the passenger compartment, a similar acoustic condition to that actually occurring in the vicinity of the ears of the occupants is faithfully reproduced, so that noises can be more effectively reduced.

Further, because the positioning of the passenger's head is interposed between the microphones, which are disposed along the laterally spaced roof rails, a wider noise-canceling region is expanded toward the height of the passenger's head.

None of the cited prior art suggests the above features. Therefore, in addition to the reasons indicated for amended claim 1, claim 3 is separately patentable for the reasons stated above.

According to dependent claim 4, the noise cancellation-confirming microphone is positioned substantially centrally between laterally spaced roof rails of the vehicle in confronting relation to the ear on the compartment side of an occupant seated in the passenger compartment. Thus, similar to claim 3, by positioning the microphone centrally between the roof rails in this manner, the relative positioning between the speaker (25) and the microphone (43, 44) is predetermined, so that the transfer function therebetween does not vary even if the positioning of the front seats is changed. Further, in addition to the advantages indicated above for claim 3, since the noise cancellation-confirming microphone is spaced from the windows, the sonic noise pressure condition in the vicinity of the occupants' ears is more closely approached, so that a more effective noise cancellation can be achieved.

Once again, the above structure and advantages are not rendered obvious from the cited references. Therefore, in addition to the reasons indicated for the independent claim, claim 4 is separately patentable for the reasons stated above.

With respect to claim 5, since this claim depends alternatively from claims 3 or 4, it is allowable at least for the same reasons discussed above. As for claim 6, the features of claim

7 have now been incorporated into claim 6, and thus this claim shall be discussed in relation to the following rejection.

Claims 7 and 9-10 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Nakao et al. further in view of Mason et al., U.S. Patent No. 5,410,607. This rejection is respectfully traversed.

Amended claim 6 sets forth a combination of elements wherein a reference signal microphone is disposed centrally in the width direction of the vehicle, so that an effect similar to that for claim 4 is attained. Further, both the microphone and the feedback control circuitry are accommodated together in the same storage box. Hence a canceling sound generating means can be positioned separately from the storage box, since the adjusting circuit adjusts the amplitude and phase between the canceling sound generating means and the microphone based on the transfer characteristic from the microphone.

Further, since the microphone and control circuit are commonly disposed in the storage box, with the canceling sound generating means being disposed separately therefrom, the storage box can be installed in a limited space, for example, as set forth in claim 9 beneath the seat. In other words, the canceling sound generating means, which does not need to be placed at the noise antinode may be made separate, whereas the microphone which may be placed at the noise antinode, is installed in an installation space at the noise antinode, permitting its use in a limited space. Still further, by installing the canceling sound generating means separately, it is also possible to use a conventional audio speaker. In this

case, the adjusting circuit functions based on a transfer characteristic between the canceling noise generating means and the microphone.

In Nakao et al., although it is shown that a vibration sensor (microphone) may be disposed beneath the seat, if such a microphone is simply a single piece, clearly it could be disposed in any of various locations. Further, according to Mason et al., although it is noted that a sensor (microphone) and circuitry are accommodated in a storage box, the speaker is also included together therewith inside the storage box. Accordingly, it is difficult for such a large-scale storage box, containing the speaker, to be placed in a limited space in a vehicle passenger compartment, and it is likely that an effective noise canceling sound could not be produced by this arrangement. Accordingly, the structure and effects of the claimed invention, which is directed to a combination of elements wherein the canceling sound generating means is disposed separately from the storage box, is not shown or suggested by the cited references, whether considered separately or in combination.

It is respectfully submitted that the structure and advantages of the claimed invention are not suggested by the cited prior art. The combination of elements as set forth in amended claim 6 are not obvious over Nakao et al. and Mason et al. As for claims 9 and 10, these claims should be allowable as dependent claims, at least for the same reasons as amended claim 6.

NO PROSECUTION HISTORY ESTOPPEL

Claim 1 has been amended to include substantially the subject matter of claims 3, 4. Claim 6 has been amended to clarify the subject matter being claimed. No prosecution history estoppel would apply to the interpretation of the limitations set forth in claims 1-6, 9 and 10 in view of the fact that this subject matter has been continuously presented since the original filing date of the present application.

CONCLUSION

In view of the above remarks, it is believed that the claims clearly distinguish over the patents relied on by the Examiner, either alone or in combination.

Since the remaining patents cited by the Examiner have not been utilized to reject the claims, but to merely show the state of the art, no comment need be made with respect thereto.

In view of the above amendments and remarks, reconsideration of the rejections and allowance of all of the claims are respectfully requested.

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

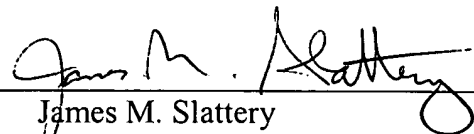
If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (703) 205-8000 in the Washington, D.C. area.

A prompt and favorable consideration of this Amendment is respectfully requested.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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